

CLAIMS

What is claimed is

- 1 1. A method comprising:
2 fabricating a plurality of lands on a surface of a substrate; and
3 forming an off-center via in each land.
- 1 2. The method recited in claim 1, wherein each land has a geometric center and
2 an edge, wherein each via has a geometric center, and wherein each via is formed
3 with its geometric center in a region between the geometric center and the edge of a
4 land.
- 1 3. The method recited in claim 2, wherein the geometric centers of vias of
2 adjacent lands are offset in substantially the same direction.
- 1 4. The method recited in claim 2, wherein in the forming operation the vias are
2 formed by drilling, and wherein the vias are drilled in a region between the
3 geometric center and the edge of a land.
- 1 5. The method recited in claim 4, wherein no via is drilled at the geometric
2 center of a land
- 1 6. The method recited in claim 4, wherein vias of adjacent lands are drilled at
2 substantially the same distance from the geometric centers of the respective
3 lands, and wherein the offsets of such vias from the geometric centers of the
4 respective lands have substantially the same angle.

1 7. A method comprising:
2 fabricating a plurality of lands on a surface of a substrate;
3 forming an off-center via in each land;
4 applying a material over the surface of the substrate, including the vias, the
5 material comprising a thermally expansive substance;
6 aligning an integrated circuit package having contacts comprising
7 electrically conductive material with respect to the lands; and
8 heating the electrically conductive material and the lands until they join.

1 8. The method recited in claim 7, wherein the contacts form a portion of a ball
2 grid array.

1 9. The method recited in claim 7, wherein the material comprises a volatile
2 organic compound.

1 10. The method recited in claim 7, wherein the material is from the group
2 comprising a solder mask, a solder flux, a solder paste, a solvent, and a via cap.

1 11. The method recited in claim 7, wherein the electrically conductive material
2 comprises solder.

1 12. The method recited in claim 7, wherein the contacts are solder balls.

1 13. The method recited in claim 7, wherein each land has a geometric center and
2 an edge, wherein each via has a geometric center, and wherein each via is formed
3 with its geometric center in a region between the geometric center and the edge of a
4 land.

1 14. The method recited in claim 13, wherein the geometric centers of vias of
2 adjacent lands are offset in substantially the same direction.

1 15. The method recited in claim 13, wherein in the forming operation the vias
2 are formed by drilling, wherein each land has an edge, and wherein the vias are
3 drilled in a region between the geometric center and the edge of a land.

1 16. The method recited in claim 15, wherein no via is drilled at the geometric
2 center of a land.

1 17. The method recited in claim 7, wherein in the applying operation the
2 thermally expansive substance is applied to the interiors of two adjacent vias, and
3 wherein in the heating operation the thermally expansive substance residing in the
4 two adjacent vias is inhibited from causing the associated contacts to be bridged
5 when the lands and contacts are subjected to heat.

1 18. A substrate comprising a plurality of lands, each land having a geometric
2 center, wherein each land has a via therein that is offset with respect to the
3 geometric center of the land.

1 19. The substrate recited in claim 18, wherein each land has an edge, wherein
2 each via has a geometric center, and wherein the geometric center of each via is in a
3 region between the geometric center and the edge of its associated land.

1 20. The substrate recited in claim 19, wherein the geometric centers of vias of
2 adjacent lands are offset in substantially the same direction.

1 21. An electronic assembly comprising:
2 an integrated circuit package; and
3 a substrate having a plurality of lands, each land having an offset via, and
4 each land being aligned with respect to a contact of the integrated circuit package.

1 22. The electronic assembly recited in claim 21, wherein each via inhibits a
2 thermally expansive substance residing in the vias from causing adjacent contacts of
3 the integrated circuit package to be bridged when the lands and contacts are
4 subjected to heat.

1 23. The electronic assembly recited in claim 22, wherein the thermally
2 expansive substance comprises a volatile organic compound.

1 24. The electronic assembly recited in claim 22, wherein the thermally
2 expansive substance comprises a volatile liquid that forms a portion of a material
3 from the group consisting of a solder mask, a solder flux, a solder paste, a solvent,
4 and a via cap.

1 25. The electronic assembly recited in claim 21, wherein the lands comprise a
2 first group having vias offset in a first direction, and a second group having vias
3 offset in a second direction.

1 26. The electronic assembly recited in claim 21, wherein each land has a
2 geometric center and an edge, wherein each via has a geometric center, and wherein
3 each via is formed with its geometric center in a region between the geometric
4 center and the edge of a land.

1 27. The electronic assembly recited in claim 26, wherein the geometric centers
2 of vias of adjacent lands are offset from the geometric centers of such lands in the
3 same direction.

1 28. An electronic system comprising an electronic assembly having an
2 integrated circuit package, and a substrate having a plurality of lands, each land
3 being aligned with respect to a respective contact of the integrated circuit package
4 and comprising an offset via.

1 29. The electronic system recited in claim 28, wherein each land has a geometric
2 center and an edge, wherein each via has a geometric center, and wherein the
3 geometric center of each via is in a region between the geometric center and the
4 edge of a land.

1 30. The electronic system recited in claim 29, wherein the geometric centers of
2 vias of adjacent lands are offset from the geometric centers of such lands in the
3 same direction.

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